depositing a protective overcoat over the surface of said integrated circuit, including the surface portions having copper metallization; and

opening selected areas of said overcoat, exposing the surface of said copper metallization.

REMARKS

Reconsideration of the above-referenced application in view of the amendments and the following remarks is respectfully requested.

Claims 1-15 were pending in this case. Non-elected claims 1-6 have been cancelled without prejudice. New Claims 16-26 have been added. Claims 7 and 12 have been amended to more clearly define the scope of the claimed invention.

Claims 7 and 12 stand rejected under 35 U.S.C. 112, second paragraph. Claims 7 and 12 have been amended such that they are in statutory form.

Claims 7, 8 and 13-15 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Molla, et al. (U.S. Patent No. 6,362,089). Applicant respectfully traverses the rejection. Claim 7 includes the step of "plating a layer of a bondable metal, by electroless deposition, said bondable metal and the thickness thereof coordinated such that said layer reduces the diffusion of said barrier metal at 250 °C by more than 80 % compared with the absence of said bondable metal, thereby forming the outermost bondable metal layer of said bond pad." Molla's gold layer is "between approximately 0.03 microns and 0.06 microns." Applicant's specification (page 13, line 20) teaches that a thickness of about 0.4 to 1.5 um is needed to meet the reduction criteria recited in Claim 7. Applicant's range is 7 to 25 times thicker than the top end of Molla's range. Molla's method does not satisfy nor does it anticipate or suggest the criteria set

forth for the bondable layer in Claim 7. Therefore, Applicant respectfully submits that Claim 7 is patentable over Molla. Claims 8 and 13-15 depend from Claim 7 and are therefore patentable for at least the reasons presented above.

Additionally, Claim 14 includes the step "wherein said electroless plating of said bondable metal layer is immersion plating followed by autocatalytic plating." It is acknowledged in the Office Action that Molla does not teach autocatalytic plating, but the Examiner argues that autocatalytic plating is well known in the art and that Molla teaches the use of techniques for forming a layer of gold that are well known to those skilled in the art. However, Applicant points out that Claim 14 does not simply recite the use of autocatalytic plating, but rather combines two different plating techniques. Molla does not teach or suggest such an approach.

Claims 9-12 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Molla in view of Lopatin, et al. (U.S. Patent No. 6,320,263). Applicant respectfully traverses the rejection. As indicated above, Claim 7 contains features not taught or suggested by Molla. Lopatin does not cure the deficiencies of Molla. Claims 9-12 depend from Claim 7 and are therefore patentable over the combined references for at least the reasons presented above.

Claims 7-15 stand provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 16-25 of copending Application No. 09/775,322. Applicant agrees to file a terminal disclaimer prior to the close of prosecution leading to the issuance of a patent in the instant application.

New Claims 16-26 include features not shown in the cited references. Therefore, Applicant respectfully requests that these claims be considered and passed to issuance.

Applicant respectfully requests reconsideration and withdrawal of the rejections and allowance of Claims 7-26. If the Examiner has any questions or other correspondence regarding this application, Applicant requests that the Examiner contact Applicants' attorney at the below listed telephone number and address.

Respectfully submitted,

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Version with Markings to Show Changes Made

In the Claims:

Please cancel non-elected claims 1-6 without prejudice.

7. (amended) A method for forming metallurgical connections between metal wires and bond pads positioned on integrated circuits having copper interconnecting metallization, comprising:

depositing seed metal to activate [activating] the surface of said copper metallization of said bond pads [, depositing seed metal];

plating a layer of barrier metal that resists copper diffusion, by electroless deposition, said barrier metal and the thickness thereof coordinated such that said layer reduces the diffusion of copper at 250 °C by more than 80 % compared with the absence of said barrier metal;

plating a layer of a bondable metal, by electroless deposition, said bondable metal and the thickness thereof coordinated such that said layer reduces the diffusion of said barrier metal at 250 °C by more than 80 % compared with the absence of said bondable metal, thereby forming the outermost bondable metal layer of said bond pad; and

bonding one of said metal wires onto said outermost metal.

12. (amended) The method according to Claim 11 wherein said metal chloride is palladium chloride[, depositing palladium seeds].

Please add the following new claims:

16. (new) A method for forming metallurgical connections between metal wires and bond pads positioned on integrated circuits having copper interconnecting metallization, comprising:

depositing seed metal to activate the surface of said copper metallization of said bond pads;

plating on said seed metal a barrier layer, by electroless deposition, said barrier layer having a thickness of at least about 0.5 μm, said barrier layer selected from a group consisting of nickel, cobalt, chromium, molybdenum, titanium, tungsten, and alloys thereof;

plating on said barrier layer a bondable layer, by electroless deposition, said bondable layer having a thickness of at least about 1.5 μm, said bondable layer selected from a group consisting of gold, palladium, platinum, and silver; and

bonding one of said metal wires onto said bondable layer.

17. (new) The method of Claim 16, wherein said step of plating on said barrier layer a bondable layer comprises the steps of:

conducting a self-limiting surface metal replacement; and

conducting an autocatalytic deposition.

18. (new) The method of Claim 16, wherein said step of plating on said seed metal a barrier layer comprises plating a barrier layer having a thickness in the range of about 0.5 μm to about 1.5 μm.

19. (new) The method of Claim 16, wherein said step of plating on said barrier layer a bondable layer comprises plating a bondable layer having a thickness in the range of about 0.4 μm to about 1.5 μm.

20. (new) The method of Claim 16, wherein said step of depositing seed metal is preceded by a step comprising:

depositing a protective overcoat over the surface of said integrated circuit, including the surface portions having copper metallization; and

opening selected areas of said overcoat, exposing the surface of said copper metallization.

21. (new) The method of Claim 20, further comprising the step of immersing said exposed surface of said copper metallization in an acid solution.

22. (new) A method for forming metallurgical connections between metal wires and bond pads positioned on integrated circuits having copper interconnecting metallization, comprising:

depositing palladium seed metal to activate the surface of said copper metallization of said bond pads;

plating on said seed metal a layer of nickel, by electroless deposition, said layer of nickel having a thickness of at least about 0.5 μm;

plating on said layer of nickel a layer of gold, by electroless deposition, said layer of gold having a thickness of at least about 1.5 μm; and

bonding one of said metal wires onto said layer of gold.

23. (new) The method of Claim 22, wherein said step of plating on said barrier layer a bondable layer comprises the steps of:

conducting a self-limiting surface metal replacement; and

conducting an autocatalytic deposition.

24. (new) The method of Claim 22, wherein said step of plating on said seed metal a barrier layer comprises plating a barrier layer having a thickness in the range of about 0.5 μm to about 1.5 μm.

25. (new) The method of Claim 22, wherein said step of plating on said barrier layer a bondable layer comprises plating a bondable layer having a thickness in the range of about 0.4 μm to about 1.5 μm.

26. (new) The method of Claim 22, wherein said step of depositing seed metal is preceded by a step comprising:

depositing a protective overcoat over the surface of said integrated circuit, including the surface portions having copper metallization; and

opening selected areas of said overcoat, exposing the surface of said copper metallization.